

CENTRAL INTELLIGENCE AGENCY
INFORMATION REPORT

REPORT

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INTELDEX II

COUNTRY Yugoslavia
SUBJECT The Bor Copper Mines

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- About 75 percent of the copper ore requirements of the milling plant in Bor are obtained from open pits located very close to the plant. One pit—about 2 kilometers in diameter—is now so close that the milling plant may soon have to be moved. The main subsidiary sources of copper ore are the copper mines located at Tiljva and Tiljva Mika.
- The main economic minerals in Bor copper ore are Chaolcocite (Cu₂S) and Covellite (CuS) with Bornite (Cu₂S.CuS.FeS) and Pyrite (FeS₂) associates. Chaolcocite, though found in smaller quantity than covellite, is of excellent quality and contains a copper concentration of 10 percent. Copper concentration in the covellite is 4 to 5 percent.
- The copper ore is crushed to 0.7 mm. and then "wet classified" in 30 meter long tanks. From "wet classification" the pulp is passed through "froth flotation" employing 350 flotation cells and borax oil reagents. Following "froth flotation" pyrite concentrate is conveyed to dumps and copper concentrate, dried, and sent to the smelting plant.
- Copper concentrate is agglomerated to nut size in 25 furnaces according to the British system, and then smelted with coke in water lined furnaces to produce copper sulphide containing 35 percent pure copper, following which it is resmelted in 6 converters to produce 90 percent copper blister. The last stage of refinement is effected through electrolysis. Here copper anodes are placed in 300 small tanks containing an electrolyte of copper sulphate solution. Pure copper sheets, or cathodes, are suspended between the anodes. With the passage of the current from the anodes through the electrolyte to the cathodes, the copper dissolves from the anodes and is deposited, more than 99.9 percent pure, on the cathodes. The impurities, which include gold, settle to the bottom of the tanks and are recovered. After the cathode copper is removed from the tanks, it is smelted, conditioned, and cast into "wire bars" (sic). In 1947 modern equipment was installed to process the gold recovered from electrolysed copper. Gold recovery now averages about 22 grams per electrolysed copper ton, and about 230 kilograms per year.

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5. With the help of foreign technicians, mostly Germans, production rose after 1946 until for the first eleven months of 1949 the production figures stood at 37,000 tons of smelted copper, of which 11,000 tons had been refined electrolytically. About 90 percent of the total production of copper in Yugoslavia is destined for export. Copper for home consumption is extremely difficult to find and very strictly controlled.
6. Until 1948 Bor received its power from a small thermo-electric station located at the plant itself, and from Nis and Zajecar power stations. In 1948 Bor was linked up with the new Mali Kostolac thermo-electric power station, capacity 4,000 kilowatts. In spite of this, power supply still remained inadequate to meet the plant's needs, especially those of the electrolytic department, and so orders were issued to hasten the completion of the Veliki Kostolac power station which the Germans began building during the war. This station has a designed capacity of 44,000 kilowatts. The first 10,500 kilowatt generator was recently installed. Work is also proceeding on the construction of a new hydro-electric power station on the Vlasina River which is planned to serve Bor, and which is scheduled for completion in 1951.
7. Coal is obtained from the Rtanj mines near Metovnica. Calcite is conveyed by cable from lime kilns 7 kilometers distant.
8. A new copper rolling mill has been built near Zajecar. The mill building--220m x 60m--has already been completed. The mill was planned to begin operating in 1948, but owing to the Cominform dispute and the fact that Czechoslovakia never delivered any of the required machinery, the mill building remains empty. This mill when completed, is planned to roll cathode copper and produce copper piping, wire and nails.

Comment: Mainly because of gold recovery, the Yugoslav Government places very great importance on increasing the production of cathode copper, and aims at producing 35,000 tons per annum--just 5,000 tons short of the present smelted copper capacity of Bor. The difficulties in achieving this target are very great: no great increase of smelted copper can be expected so long as present worn or obsolete smelting equipment is retained, and no great increase of cathode copper can be expected so long as the present limited power supply is not considerably increased.

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